Unit 2
Aquatic Life

Plants, animals, and other life forms have adapted to live and reproduce in aquatic habitats. Iowa's waters are home to thousands of plant and animal species. This section provides a brief introduction to the different types found in our waters.

Plants

Aquatic plants are essential in aquatic ecosystems. They provide oxygen, food, shelter, and protect shorelines and stream banks from eroding. They have a variety of adaptations to living in, on, or near water and are divided into several groups.

Algae

Algae are single-celled aquatic plants. They often are the producers in aquatic food webs. Algae are unique because although they may form spheres, sheets, or filaments, each cell acts like an independent organism. They are the simplest of all plants. (They are not considered to be plants by some scientists and are placed in the kingdom Protista.)

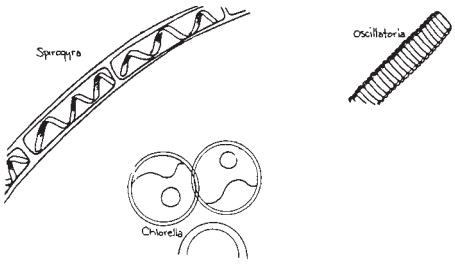
Two common types found in our waters are green algae and blue-green algae. **Green algae** are considered the basic biological element of quality aquatic ecosystems and may consist of single cell or multiple-cell "colonies" that give water a greenish color.

Blue-green algae are commonly nuisance algae associated with stressed ecosystems. They can form a stagnant coating on the water surface and produce a rather musty smell. This produces the "off" flavor sometimes found in fish. Toxins produced by these algae also can kill fish.

Diatoms are another group of beneficial algae used to date sediments. These algae produce a silicon (glass-like) skeleton that does not break down over time.

Liverworts and Mosses

Liverworts and **mosses** usually are found growing in moist soil along shorelines of water bodies. These simple plants grow in dense mats, usually on ground that has been disturbed. They are more complex than algae. The cells work together, but they do not have conducting cells to move water and food between cells. They readily take up water and hold soil together to help reduce soil erosion.



Vascular Plants

Vascular plants have conducting cells which make "tubes" that carry food, water, and minerals through the plant. They are the most complex and largest members of the plant kingdom.

Aquatic vascular plants can be grouped based on their location in relation to the shoreline and the depth at which they grow. **Emergent** plants grow in wet soils along the shore out to a depth of about five feet. They emerge above the water. Cattails, rushes, and reeds provide shelter and nesting places for birds such as yellow-headed and red-winged blackbirds.

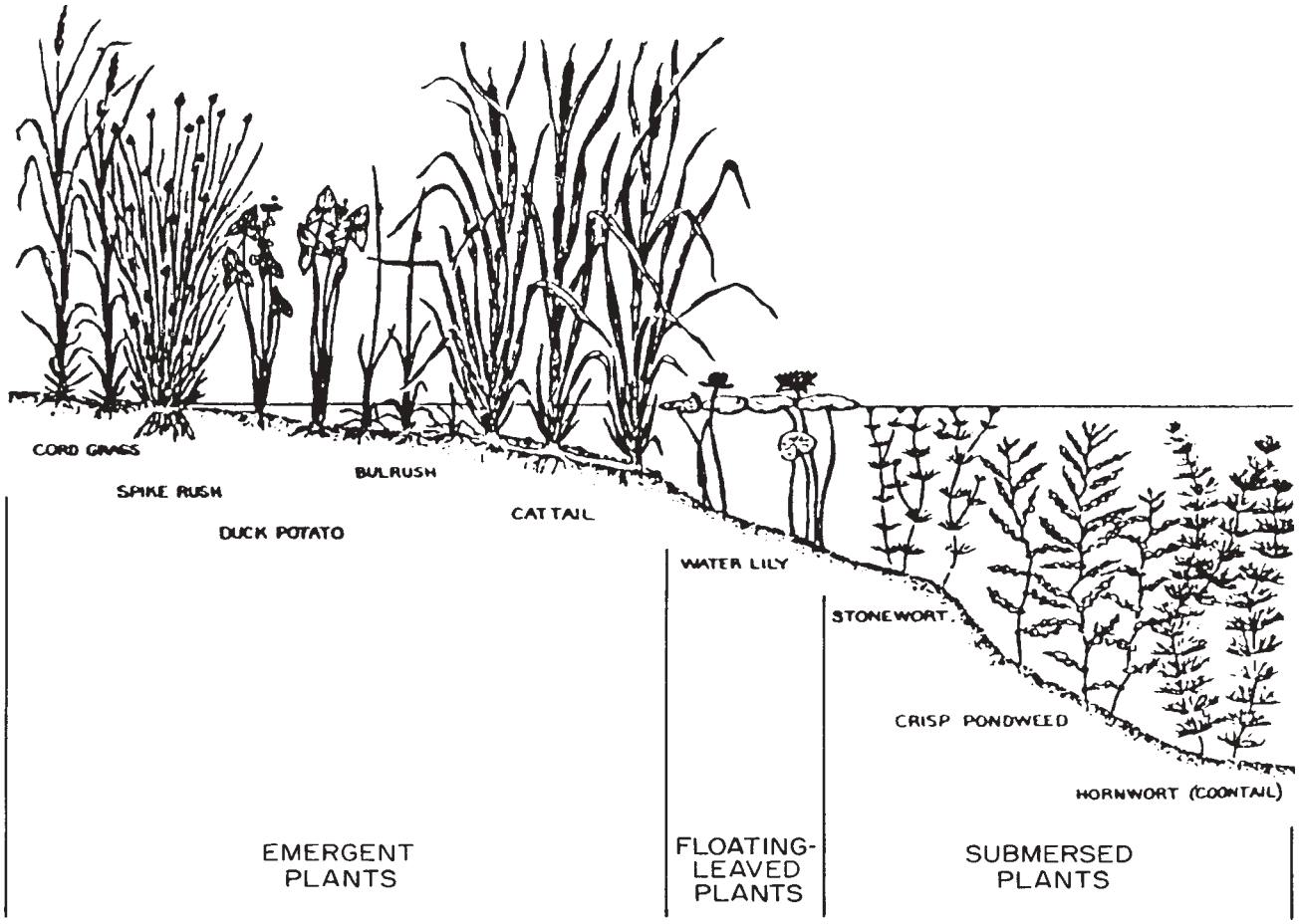
Submergent plants are rooted and grow in water depths from about one foot to the depth where sunlight reaches the bottom. Submergent plants (e.g., coontail, pondweeds) provide hiding places for small fish and invertebrates.

Floating-leaved plants grow in water from about one to ten feet deep. They are rooted and have long, flexible stems with leaves that float on the water's surface (e.g., American lotus).

There also are **free-floating** plants that have small leaves with roots dangling in the water. Duckweed is a well-known free-floater that is essential food for waterfowl.

Some common examples of each type of plant include:
Emergents–cattails, rushes, reeds, sedges, arrowhead, willows
Floating-leaved plants–water lilies, American lotus, some pondweeds
Submersed plants–elodea, some pondweeds, naiads, coontail, milfoil
Floating plants–duckweed, watermeal

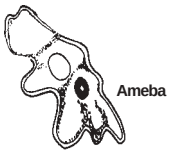
Note: Supplemental information for the activity, "Water Plant Art," includes line drawings of common aquatic plants.



Animals

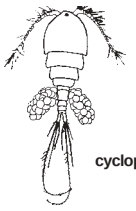
Protozoans

Some animal-like "critters" are made up of only one cell and are called **protozoans** (e.g., ameba, paramecium). Protozoans, like algae, are placed in the kingdom Protista by many scientists. Protozoans are part of the very important group known as **zooplankton**.


Ameba

Zooplankton literally means "animal wanderer." Zooplankton includes a variety of microscopic animals and animal-like creatures that are essential as food for larger organisms such as fish. (See "A Guide to the Ecosystem Concept" in the *WILD Aquatic* guide.) Microscopic invertebrates such as water fleas (*Daphnia*) and cyclops as well as fish eggs and larva also are part of the zooplankton community.


Paramecium

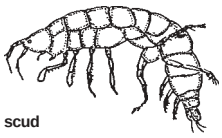

cyclops

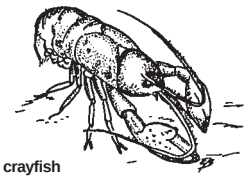
Invertebrates

Invertebrates are the least conspicuous, but most abundant, animal group. They range in size from microscopic to larger than a baseball. Invertebrates found in Iowa waters range from freshwater sponges to worms and crustaceans (scuds, copepods, and crayfish), mollusks (mussels and snails), arachnids (spiders, ticks, and mites), and insects.

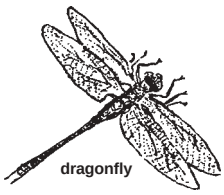

water flea

Three groups of **worms** (flatworms, roundworms, and segmented worms) are found in Iowa waters. This group ranges in size from microscopic to several inches. The most familiar **flatworms** are planaria, which are about half an inch long (used in many scientific experiments because of their remarkable regenerative powers). Thin, small **roundworms** live in freshwater and soil, but parasitic roundworms (such as pinworms) are more familiar to most people. **Segmented worms** include leeches. Many are predators with specialized mouth parts for piercing their prey and eating blood or soft tissue.


scud


crayfish

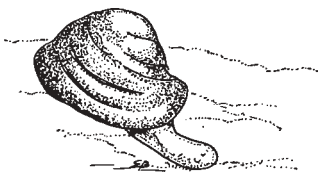
Arthropods have jointed appendages and hard body coverings. This group represents about 78 percent of all known species of animals. Crustaceans (crayfish, water fleas, sowbugs, etc.), centipedes, millipedes, insects, spiders, ticks, and mites all are part of this very large group of animals. Many are food for birds, amphibians, reptiles, and fish.


dragonfly

Many terrestrial **insects** (arthropods with three distinct body regions and three pairs of legs) have an aquatic immature stage. Mayflies, dragonflies, damselflies, stoneflies, caddisflies, and mosquitoes all are aquatic during part of their lives. Some insects (e.g., diving beetles, water scorpions, water boatmen) are adapted for an entirely aquatic life.


snail

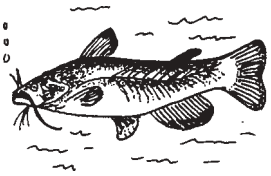
Snails and freshwater mussels are the most common **mollusks** in our waters. They have soft bodies that often are covered by a calcium-rich shell. Snails usually are in still or slowly moving waters. Most of these slow moving creatures eat plants. Mussels, because they are **filter-feeders** and sensitive to pollutants, often are used as water quality indicators. As adults, most are sedentary and cannot leave areas when water quality becomes poor.


freshwater mussel

The presence of mussels that grow to a large size is an indicator of good water quality. They are abundant in clear waters, but their numbers are greatly reduced in silt-laden waters.

Vertebrates

Fish


bullhead

There are 148 species of fish found in Iowa waters. Some (e.g., largemouth bass, bluegill, channel catfish) are found throughout the state in many different kinds of water. Others (e.g., trout, smallmouth bass, paddlefish) are more restricted in distribution. Iowa fish range in size from minnows and darters that grow to only an inch or two as adults to large fish found in the Mississippi River such as paddlefish, which can weigh over 100 pounds.

The major fish groups in Iowa include primitive fish (lampreys, paddlefish, sturgeon, gar, and bowfin), trout, herring, mooneye, pike, suckers, minnows, catfish, temperate bass, sunfish, and perch. Consult the brochure, "*Fish Iowa!* An Introductory Guide to the Fish of Iowa" for more information about individual species of Iowa fish.

Amphibians

Amphibians have smooth, moist skin with many glands. They have four limbs and digits without claws. Five kinds of salamanders and 16 types of frogs are found in Iowa.


bullfrog

Habitat loss and degradation are the most serious threats to frog and salamander populations. Aquatic habitats are breeding, larval, and wintering (hibernating) habitat for most Iowa amphibians. Amphibians prosper in areas without fish or bullfrogs (main predators on larval stages). They also do well in aquatic areas that have an abundance of submerged vegetation to provide adequate escape cover.

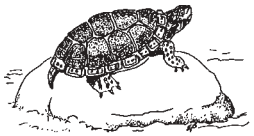
With few exceptions, amphibians lay their eggs in water. Jelly-like masses are laid in shallows, usually attached to plants. They hatch quickly; some within a few days. In spring, our waters are alive with the sounds of frogs and toads searching for mates. Young eat algae and small invertebrates. Many are food for other aquatic animals.

Some amphibians spend their adult life far from standing water, but their thin, moist skin restricts their distribution to fairly moist habitats. (Some toads are able to live in very dry areas by secreting a protective coating onto their skin and burrowing into the ground.) Bullfrogs, leopard frogs, chorus frogs, and cricket frogs are found throughout the state near ponds, wetlands, and roadside ditches. The tiger salamander is the most common in Iowa. See the IDNR publication, *The Frogs and Salamanders of Iowa,* for information about Iowa amphibians.

Reptiles

Reptiles (like amphibians) are cold-blooded, but they have dry, scaly skin with almost no glands and their digits have claws. In Iowa, this group includes turtles and snakes. Some species of reptiles are dependent on aquatic habitats, but most can live and reproduce great distances from water. Reptile eggs have a leathery shell and are laid on land. The young do not go through metamorphosis like amphibians; they hatch into miniature adults.

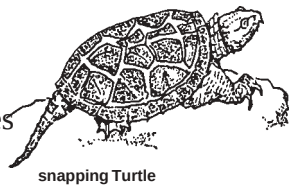
Turtles are protected by a hard shell (carapace). The upper and lower jaws are covered with a sharp-edged beak, which (because the lower jaw fits inside the upper) allows them to use their jaws like scissors to tear off bits of food.



painted turtle

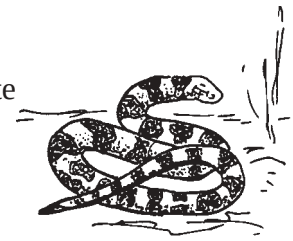
The western painted turtle and the red-eared turtle are common in Iowa. They spend much of their time basking in the sun on logs or rocks in slow-moving rivers, sloughs, oxbow lakes, ponds, and drainage ditches. Both prefer areas with sufficient aquatic vegetation for food and shelter. These colorful turtles eat aquatic plants, snails, crayfish, insects, and some fish. The red-eared turtle can be distinguished from the painted turtle by the distinct red or orange stripe normally present on each side of the head behind the eye.

Snapping turtles are commonly found in Iowa farm ponds, streams, rivers, swamps, and lakes. They are grayish-brown in color, but the upper shell usually is covered with mud or algae. Snappers eat animals and aquatic plants. Snapping turtles are trapped for food.



snapping Turtle

Snakes can swim, but just a few species are associated with aquatic habitats. The smooth green snake is a small, docile prairie marsh dweller as is the rare massasauga rattlesnake. Iowa's three species of garter snakes are associated with aquatic habitats and eat insect larvae, amphibians, and fish. The northern water snake is an aggressive aquatic reptile. It is a fish-eater and is non-venomous, but will not hesitate to bite if cornered.



water snake

For more information about Iowa reptiles, see the IDNR publications, *The Snakes of Iowa* and *The Lizzards and Turtles of Iowa*.

Birds

Of the approximately 370 species of birds that have been seen in Iowa, about 145 usually are found in some sort of wetland habitat. Lakes and streams provide essential habitat for many other species. The Mississippi and Missouri Rivers are major flyways for migratory birds of all kinds. The Mississippi Flyway is a corridor for 40 percent of North America's waterfowl and shorebirds.

Following are some birds that can be found near Iowa waters:

American and least bittern, American coot, American widgeon, bald eagle, common and hooded merganser, black crowned night-heron, black tern, blue-winged and green-winged teal, Canada geese, cattle egret, double-crested cormorant, Forster's tern, gadwall, great blue heron, great egret, green heron, hawks, killdeer, kingfishers, king rail, loons, mallards, northern pintail, northern shoveler, osprey, pied-billed grebe, plovers, red-winged blackbird, ring-billed gull, ring-necked duck, ruddy duck, scaup, snow geese, snowy egret, sora rail, sparrows, swallows, thrushes, trumpeter swans, vireos, Virginia rail, warblers, white pelican, wood duck, woodcock, woodpeckers, wrens, and yellow-headed blackbird

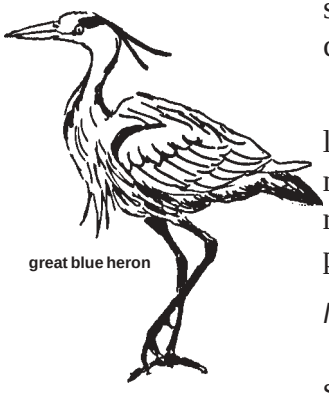
Some of the more familiar birds noticed by even casual observers:

migrating Canada geese

Waterfowl (e.g., swans, geese, ducks) are built to maneuver in water. They float, have webbed feet for speedy, over-water locomotion, have water-proof feathers and insulating down, and some can even use their wings to propel them under water. Canada geese and many ducks have bills for straining vegetation or invertebrates from water. Mergansers are fish-eaters with spike-like bills with sawtooth margins. Most waterfowl are migratory, flying south for the winter and flying back north in the spring.

Bald eagles can be seen near water scouting for fish. Bald eagles mate for life and usually use the same nest year after year. In 1995, Iowa had at least 35 nesting pairs. In 1996, 1,416 bald eagles were counted wintering in 39 Iowa counties. The number of bald eagles in Iowa has nearly doubled since 1992.

Double-crested **cormorants** are seen near Iowa rivers and wetlands. They are large, black birds that often stand on rocks or branches near water with wings spread. Cormorants are colony nesters and are rare nesters in Iowa. Double-crested cormorants were found nesting in five colonies in 1996, all on the Mississippi River.



great blue heron

Great blue **herons** are large wading birds with long necks and legs and spear-like bills. They fly with their necks folded in an S-shape. They are common near marshes, ponds, lakes, or backwater areas of rivers. Twenty-seven great blue heron rookeries were reported in Iowa in 1996. Of the total number of nests reported, 78 percent were on the Mississippi River.

Mammals

Many small mammals are associated with aquatic habitats. Mice, voles, and shrews can be found tunneling through grass at the waters edge. Several species of bats can be seen in foraging flights for insects over water in the evenings. Beaver, muskrat, and river otters are larger mammals that are closely linked to water.

Beavers are large rodents. They have dark brown fur with a huge flat, hairless tail. Beaver dams on small streams and rivers, create ponds and sometimes flood areas upstream from the dam. These engineers cut down nearby trees with their sharp teeth to construct their homes.

muskrat

Muskrats are small rodents that often burrow into stream or river banks. They build lodges or huts made mainly of cattails and rushes in wetland areas. Like beaver, muskrats are plant eaters.

Otters were abundant along rivers and streams before white explorers settled in Iowa. They were essentially eliminated from central and western states by the early 1900s because of habitat loss, over harvest, and water contamination. Otters have since been reestablished in Iowa through reintroduction programs from 1985-1990.

The otter is a playful furbearer that has rich brown fur with a light underside and grayish throat and chin. These graceful swimmers like to use abandoned lodges of beavers for their home. Otters no longer are on the endangered species list in Iowa but cannot be trapped legally.

Raccoons often acquire food from water in the form of fish and mussels. Other "upland" animals (e.g., mink, weasels, fox, skunks) may search the water's edge for prey.


mink

For more information about aquatic plants and animals, including identification, life history, habitat, etc., consult the following resources:

Teacher Aids

Audiovisual Program: Aquatic Life
Posters: Life in A Stream, Aquatic Life, Fish Iowa!: An Introductory Guide to the Fish of Iowa
CD: Biodiversity of Iowa: Aquatic Habitats

Other Materials

Reference Materials:

Christiansen, J.L. and R.M. Bailey. 1991. The Salamanders and Frogs of Iowa: Nongame Technical Series No. 3. Des Moines: Iowa Department of Natural Resources.

Christiansen, J.L. and R.M. Bailey. 1988. The Lizards and Turtles of Iowa: Nongame Technical Series No. 3. Des Moines: Iowa Department of Natural Resources.

Christiansen, J.L. and R.M. Bailey. 1987. The Snakes of Iowa: Nongame Technical Report No. 1. Des Moines: Iowa Department of Natural Resources.

Cummings, K. and C. Mayer. 1992. Field Guide to Freshwater Mussels of the Midwest. Champaign, IL: Illinois Natural History Survey.

Eilers, L.J. and D.M. Roosa. 1994. The Vascular Plants of Iowa: An Annotated Checklist and Natural History. Iowa City: University of Iowa Press.

Hothchkiss, N. 1972. Common Marsh, Underwater and Floating-leaved Plants of the United States and Canada. New York: Dover Publications, Inc.

Jackson, L., Thompson, C. and J. Dinsmore.1996. Iowa Breeding Bird Atlas. Iowa City: University of Iowa Press.

Laubach, C.M., Bowles, J. and R. Laubach.1988. A Guide to the Bats of Iowa. Nongame Technical Series No.2. Des Moines: Iowa Department of Natural Resources.

Mayhew, J. (ed.). 1987. Iowa Fish and Fishing. Des Moines: Iowa Department of Natural Resources.

Winterringer, G. and A. Lopinot. 1977. Aquatic Plants of Illinois. Springfield: Illinois State Museum.

Popular Field Guides:

Peterson First Guides - Birds, Fishes, Insects, Mammals, Reptiles and Amphibians
Peterson Field Guides - Animal Tracks, Eastern Birds, Eastern Reptiles and Amphibians, Freshwater Fishes, Insects of North America, Mammals
Audubon Society Field Guides - Birds-Eastern, Insects and Spiders, Mammals, Reptiles and Amphibians
Audubon Society Pocket Guides - Animal Tracks, Insects and Spiders, Mammals, Reptiles and Amphibians, Familiar Birds of Lakes and Rivers
Golden Guides - Bats, Bird Life, Birds, Butterflies and Moths, Insects, Mammals, Pond Life, Reptiles and Amphibians, Spiders and Their Kin
Stokes Nature Guides - A Guide to Amphibians and Reptiles, A Guide to Animal Tracking and Behavior.

Popular Literature:

Arnosky, J. Come Out, Muskrats. William Morrow & Co. (beginning readers) The muskrats habitat is a peaceful pond teeming with animal life. Watch the busy muskrats feed, swim, and play into the night.

Amosky, J. Deer at the Brook. William Morrow & Co. (beginning readers) Watch deer taking a drink at a sparkling brook, nibbling at blossoms, and playing together on a summer's day.

Arnosky, J. Otters Under Water. Putnam. (ages 3-6) Two otter pups swim, dive, and explore. They encounter newts, turtles, ducks, muskrat, and fish on their underwater adventure.

Dinsmore, J.J. 1994. A Country So Full of Game. Iowa City: University of Iowa Press. A description of what Iowa wildlife was like before settlement. Well researched and contains many anecdotes and unique stories from writings of early settlers.

Eyewitness Juniors. *Amazing Fish and Amazing Frogs and Toads.*

George, W.T. 1988. Beaver at Long Pond. As the other animals at Long Pond settle down for the night, Beaver leaves his lodge, begins searching for food, and starts his nightly adventure.

George, W.T. 1989. Box Turtle at Long Pond. On a busy day at Long Pond, Box Turtle searches for food, basks in the sun, and escapes from a raccoon.

George, W.T. 1991. Fishing at Long Pond. William Morrow & Co. (ages 4 and up) While fishing for bass, Katie and her grandfather observe a deer, an osprey, a goose, and other pond visitors.

Johnson, S.A. 1989. Water Insects. Minneapolis: Lemer Publications Co. Big color photos and descriptions of aquatic invertebrates and their life cycles.

Johnston, G. and J. Cutchins. Scaly Babies. Morrow Junior. (ages 7 and up) An unusual look at how baby reptiles survive their first year of life.

Johnston, G. and J. Cutchins. Slippery Babies. William Morrow & Co. (ages 7 and up) A fascinating look at the amazing amphibian world.

Kindersley, D. Eyewitness Books. Amphibian, Fish, Pond and River. (all ages)

Kindersley, D. See How They Grow: Frog. (ages 5-8) Shows the sequence of growth from new-born to young animal. (Endearing natural history book for the very young)

Lacey, E.A. The Complete Frog. William Morrow & Co. (ages 5-9) The evolutionary history of frogs, their biology and behavior, the responsible way to catch and study them (including letting them go), even frogs in literature are discussed in concise, readable prose.

Lyons, J. and S. Jordan. Walking the Wetlands. John Wiley & Sons, Inc. A hiker's guide to common plants and animals of marshes, bogs, and swamps.

Mazer, A. The Salamander Room. Random House. (ages 4-8) Brian finds a salamander and takes him home. Brian imagines his room as a salamander's paradise with wet leaves, crickets, birds, and amphibious friends. An introduction to ecology cloaked in fantasy to appeal to every child who has wished for an unsuitable pet.

My First Nature Books. Toad. American Education Publishing. (ages 5-8) Designed to arouse and encourage a child's curiosity about the world around us.

Stutson, C. On the River ABC. Roberts Rinehart. (beginning readers) A ladybug is sent downstream by a sudden rainstorm, encountering wildlife inhabiting the river as she winds through the alphabet.

Turner, C. The Turtle and the Moon. Penguin USA. (ages 4-7) The turtle who lives in the grass has no one to play with until the night he pokes his head out of his shell and sees something wonderful by the side of the lake.

Winslow Parker, N. and J.R. Wright. Frogs, Toads, Lizards, and Salamanders. William Morrow & Co. (ages 6 and up) Hopping, burrowing, jumping, swimming, climbing, running, and digging—sixteen examples from the amphibian and reptile worlds, found all over the United States.

Demonstration Models:

Stream Table and EnviroScape - contact Aquatic Education Program, 2473 160th Road, Guthrie Center IA 50115 (641/747-2200; email:Beverly.Stringer@dnr.state.ia.us) for listing of organizations/agencies which have models available for loan

Other:

Iowa DNR home page (www.iowadnr.com)
Fish and Wildlife Service home page (www.fws.gov)

WILD Aquatic Activities (grade level)

Aquatic Roots (5-8)
Are You Me? (K-4)
Blue Ribbon Niche (5-8)
Designing a Habitat (5-8)
Edge of Home, The (5-8)
Fashion a Fish (K-4)
Fishy Who's Who (5-8)
Marsh Munchers (K-4)
Micro Odyssey (5-8)
Migration Headache (5-8)
Puddle Wonders! (5-8)
Riparian Retreat (5-8)
Water Canaries (5-8)
Water Plant Art (K-4)
Water We Eating? (K-4)
Wetland Metaphors (5-8)

** Supplemental information provided for italicized activities.*